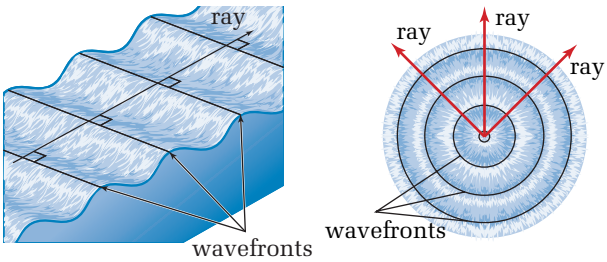
INVESTIGATION 9-A

Properties of Waves

TARGET SKILLS

- Performing and recording
- Analyzing and interpreting
- Identifying variables

For light to be classified as a wave, it must exhibit specific properties of waves. In this investigation, you will analyze an important property of water waves that must also be true of light — if light is, in fact, a wave.



Problem

Investigate how waves behave when they

(a) encounter a small barrier

(b) pass through a narrow slit

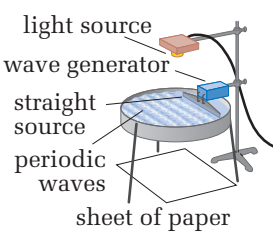
Equipment

- ripple tank
- wave generator
- 2 solid barriers (less than half the width of the tank)
- wooden dowel

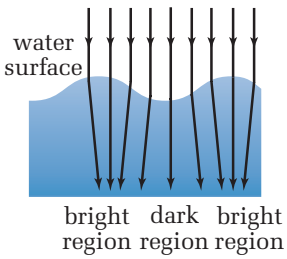
CAUTION Care must be taken with any electrical equipment near ripple tanks. Firmly attach lights and wave generators to the tank or lab bench, and keep all electrical wiring away from the water.

Procedure

1. Assemble the ripple tank, light source, and wave generator as shown in the diagram. Add water and carefully level the tank so that the depth of the water is approximately 1.5 cm at all points in the ripple tank.



A Wave tank set-up



B Water as a lens

2. Align the straight-wave generator so that parallel wavefronts travel perpendicularly from the dowel. Vary the frequency of the generator to find a wavelength that produces the clearest image on the paper below the tank. Use the light and dark regions cast on the paper to view the wave properties during the investigation.
3. Place a solid barrier in the tank that is about half the width of the tank. Send straight waves at the barrier and observe their behaviour. Sketch the appearance of the waves as they pass the edge of the barrier.
4. Vary the wavelength of the incident waves. Draw cases that exhibit maximum and minimum spreading around the edge of the barrier.
5. Place two solid barriers in the tank, leaving a narrow slit between them. Send straight waves toward the narrow opening and observe the nature of the waves that pass through it.
6. Systematically vary the width of the opening and then the wavelength to determine a general relationship between the amount of the spreading of the waves, wavelength, and the size of the opening.

Analyze and Conclude

1. Describe what happens to waves when they pass the edge of a solid barrier. Is the effect altered as wavelength is changed? If so, how?
2. Describe what happens when waves pass through a narrow opening between two solid barriers. What relationship between the wavelength and the width of the opening appears to be the most significant?

Apply and Extend

3. In your experience, does light exhibit any of the properties of waves that you have just studied? Provide examples.